

Approved by:

_____/_____/_____
Process Engineer_____/_____/_____
Equipment Engineer

1 SCOPE

The purpose of this document is to detail the use of the MOS Grade RCA Bench for wet cleaning of silicon wafers. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

2 REFERENCE DOCUMENTS

- Safety Data Sheets for Sulfuric Acid, Hydrofluoric Acid, Hydrochloric Acid, Ammonium Hydroxide and Hydrogen Peroxide.
- Safety Training.

3 DEFINITIONS

DI	-De-Ionized Water
HF	-Hydrofluoric Acid
HCl	-Hydrochloric Acid
NH ₄ OH	-Ammonium Hydroxide
H ₂ O ₂	-Hydrogen Peroxide
H ₂ SO ₄	-Sulfuric Acid

4 TOOLS AND MATERIALS

- 4.1 General Description** - This RCA bench is intended for cleaning MOS Grade wafers before critical process steps. This RCA bench is set up with three quartz temperature controlled tanks for a Piranha bath, SC1 and SC2 and a plastic tank for a 50:1 HF dip. There are also three rinse tanks.
- 4.2 Wafer Boats** - Only dedicated Teflon wafer boats and handles should be used for processing on this bench. All of the dedicated boats and handles will have three holes to mark them. These boats and handles should not go on the cart or in the dishwasher.

5 SAFETY PRECAUTIONS

5.1 Personal Safety Hazards

- 5.1.1 **Chemical** - The RCA clean Station uses several hazardous chemicals, sulfuric acid H_2SO_4 , ammonium hydroxide NH_4OH , hydrochloric acid HCl and hydrogen peroxide H_2O_2 , and hydrofluoric acid HF . Users should be aware of the unique hazards of the materials with which they are working, especially HF which is potentially lethal. If HF is spilled on a person, hospital treatment will be necessary. Immediately rinse with large amount of water for 2 minutes, apply calcium gluconate to the affected area and inform SMFL staff member or lab instructor. If another chemical is spilled, remove clothing and rinse affected area in safety shower for 15 minutes and inform SMFL staff member or lab instructor.
- 5.1.2 **PPE** - When working at the RCA Clean station, always use appropriate personal protective equipment (PPE)—apron, face shield and heavy rubber gloves.
- 5.1.3 **Chemical Contamination from PPE** - The PPE should not be worn any place other than the immediate vicinity of the RCA Clean Station. Do not walk away from bench while wearing PPE. If assistance is needed (i.e. to grab a Kim Wipe or timer, etc.), ask for assistance—do not get it while wearing PPE. Do not work at computer or answer the phone while wearing PPE. When finished at the RCA Clean station, rinse the PPE, fully dry it and return to hook.
- 5.1.4 **Spill Clean Up** - It is imperative that all spills be cleaned up immediately because of the number and variety of materials used at this bench. Please see a staff member for assistance in cleaning up spills.

5.2 Hazards to the Tool

- 5.2.1 **Proper Level** - Never operate the heated tanks without the proper fluid level.
- 5.2.2 **Chemical Damage** - Operate the bench controls with clean gloves only. The chemicals used will cause damage.
- 5.2.3 **Tank Damage** - Tanks are breakable, carefully place wafers in them, never bang a cassette on the side and do not drop the aspirator into the tank.
- 5.2.4 **Cross Contamination** - The RCA clean station is a “clean” area and only RCA cleans should be performed at the bench. All other wet processing should be done at another appropriate bench. No metals, photoresist or wafers that have been in CMP or KOH.
- 5.2.6 **Dedicated Labware** - For this bench only, all cassettes, handles and beakers are to remain with the bench. *They should **not** go on the cart or in the dishwasher and should **never** be used on any other bench.*
- 5.2.7 **Aspirating Hot Chemistry** - Do not aspirate hot chemicals. The temperature should be below 30C before aspirating.

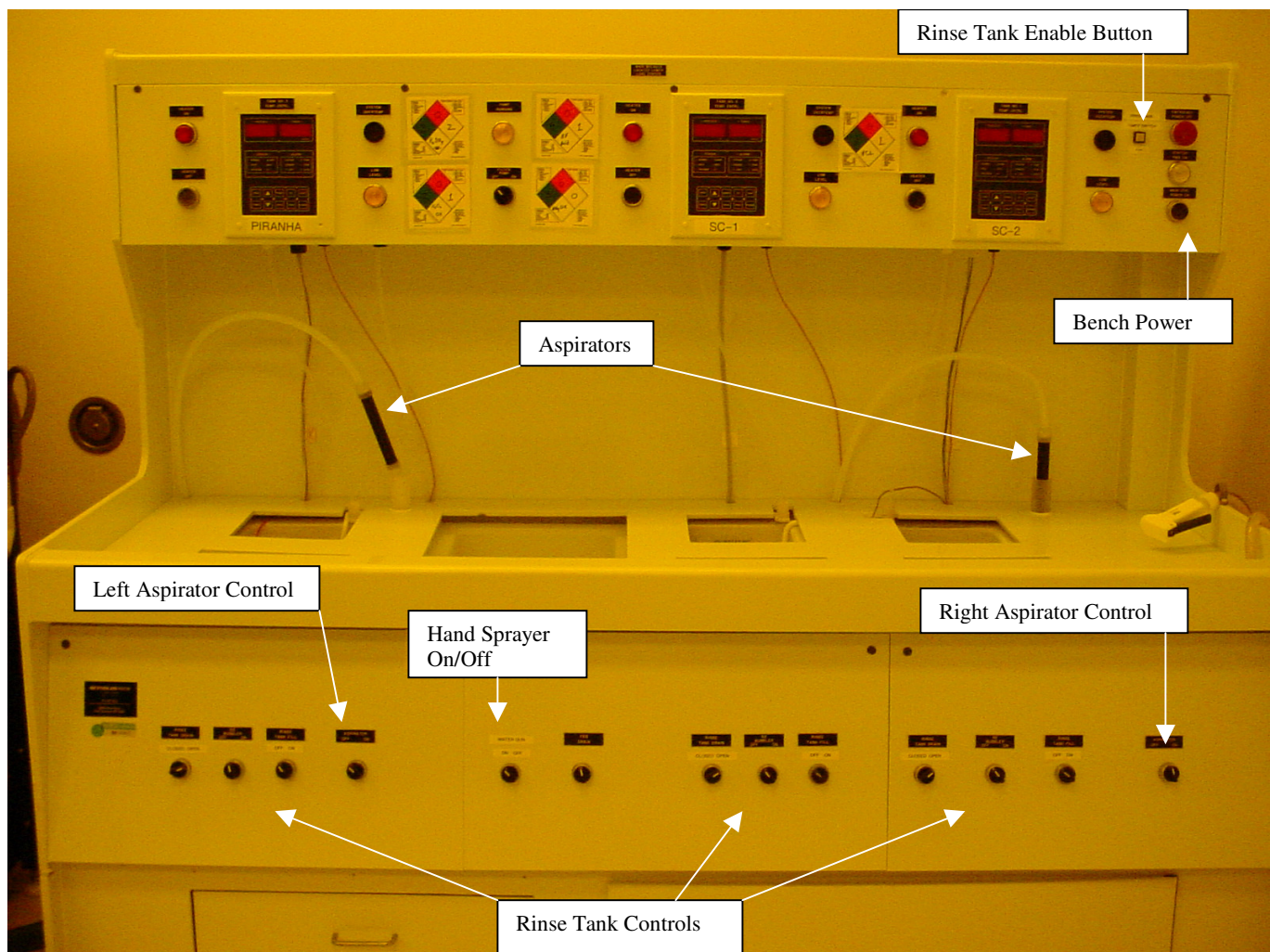
6 INSTRUCTIONS

6.1 Initial State Check

- 6.1.1 Make sure cover is on piranha tank before doing an RCA.
- 6.1.2 Verify that there are sufficient amounts of the chemicals that you will need in the chemical storage cabinet.
- 6.1.3 Make sure that the bench has power, DI water and nitrogen.
- 6.1.4 Make sure that you have reserved the bench with the Tool Reservation System and that you have swiped in your card on the card swipe system.

6.2 Resetting the System

- 6.2.1 The temperature controllers may be reset by cycling their power on and off.



6.3 Operating the system

- 6.3.1 Turn on the main power to the bench with the **Power On Main CTRL** button.
- 6.3.2 If the bench has been recently used, you may just recharge the chemical baths by adding 200mL of Hydrogen Peroxide to both of the quartz tanks.
- 6.3.2 If the chemicals are old, wait until the temperature is less than 30C and drain the old chemicals using the aspirators. The aspirator controls are located on the lower panel. Rinse out the tanks with the sprayer and then aspirate the rinse water.
- 6.3.3 If mixing a piranha clean add Sulfuric Acid first. Next add Hydrogen Peroxide and **allow to sit 10 minutes before turning on the heater since the chemicals will heat up on their own**. This will prevent the temperature from overshooting. After 10 minutes is up, stir and then turn on the heater.
- 6.3.4 Add **5200mL** of **DI** water to the SC1 and SC2 tanks. Use the spray hose to fill the beaker.
- 6.3.5 Turn on the temperature controllers on the upper panel for the tanks that you will be using.

- 6.3.6 On the controller, press **Reset** to remove the system from the hold state. To start a tank heating, press the **Heater On** button to the left of the controller.
- 6.3.7 For the SC1 bath, add **300mL** of **Ammonium Hydroxide** and then **300mL** of **Hydrogen Peroxide**.
- 6.3.8 For the SC2 bath, add **300mL** of **Hydrochloric Acid** and then **300mL** of **Hydrogen Peroxide**.
- 6.3.9 Wait for the tanks to heat up to 75C.
- 6.3.10 The 50:1 HF tank usually does not need changing. If there is a problem, see a SMFL staff member. Only staff may change HF.
- 6.3.11 The rinse tanks are operated on the lower panel after the **Rinse Tank Enable** button has been enabled. The **Rinse Tank Enable** button will have to be re-enabled after 15 minutes have passed. For each tank there is a switch to stop and start the water and another switch to open and close the drain. **The rinse tank fill switch should be turned off to conserve water when there are no wafers rinsing.**
- 6.3.12 The clean proceeds as follows:
- | | | |
|--|-------------------|------------------------------------|
| Piranha Clean | 10 minutes | (piranha clean is optional) |
| Rinse | 5 minutes | |
| 50:1 HF dip | 1 minute | (may be moved between SC1 and SC2) |
| Rinse | 5 minutes | |
| SC1 | 10 minutes | |
| Rinse | 5 minutes | |
| SC2 | 10 minutes | |
| Rinse | 5 minutes | |
| Rinser/Dryer (Run the rinser/dryer with an empty cassette before running your wafers) | | |
- 6.3.13 To silence an alarm during the clean, press the **SIL** button on the temperature controller.

6.4 Shutdown

- 6.4.1 Turn the **Water Gun Switch** off.
- 6.4.2 Turn the **Rinse Tank Fill** switch off and then drain the rinse tanks.
- 6.4.3 Press the **Emergency Power Off** button.
- 6.4.4 Swipe out on the card swipe system.

6.5 Errors during Run

- 6.5.1 If the controller does not turn on, make sure that the bench power is on and the tool is swiped in.
- 6.5.2 If the controller alarms or does not heat, an interlock may be tripped. Contact an SMFL staff member for assistance.
- 6.5.3 If a wafer falls out or breaks, do not attempt to retrieve it. Contact an SMFL staff member.
- 6.5.4 If the rinse tank will not operate, press the **Rinse Tank Enable** button again.

7 Appropriate Uses of the Tool

7.1 This tool is intended for RCA Cleaning of MOS Grade silicon wafers only. No exceptions.

7.1.1 If a wafer has ever had any metal on it, it may not be processed in this bench.

7.1.2 If a wafer has ever been KOH etched it may not be processed in this bench.

7.1.3 No wafers with photoresist on them.

7.1.4 Wafers that have been through a CMP process are not allowed in this bench.

7.1.5 If your wafers have an unknown contaminant on them, they are not allowed in this bench.

7.2 Process tanks are labeled for their appropriate uses and should *never* be used for anything else.

7.3 Process temperatures are set and should not be changed without SMFL approval.

7.4 Only the dedicated wafer cassettes and handles may be used in this bench.

REVISION RECORD

Summary of Changes	Originator	Rev/Date
Original Issue	Sean O'Brien	A-11/20/2003
Modified 5.1.4, 6.3.2, 6.3.11, added 5.2.7	Sean O'Brien	B-08/05/2008
Updated	Meller/O'Brien	C-05/26/2020